

SEQUENCE LISTING

<110> Vadim R. Viviani
Yoshihiro Ohmiya

<120> Nucleic Acid Molecules Encoding Red and
Green Emitting Luciferases

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Glu Arg Pro Arg Asp Ile Val His Pro Gly Ser Ala Gly Gln Gln Leu
10 15 20 25

tac caa tca ttg tat aaa ttt gca tct ttt cct gaa gca ata atc gat 148
Tyr Gln Ser Leu Tyr Lys Phe Ala Ser Phe Pro Glu Ala Ile Ile Asp
30 35 40

gct cat aca aat gaa gta ata tca tat gct caa ata ttt gaa acc agc 196
Ala His Thr Asn Glu Val Ile Ser Tyr Ala Gln Ile Phe Glu Thr Ser
45 50 55

tgc cgc tta gct gtt agt ata gaa caa tat ggc ttg aat gaa aac aat 244
Cys Arg Leu Ala Val Ser Ile Glu Gln Tyr Gly Leu Asn Glu Asn Asn
60 65 70

gtt gtg ggt gta tgc agt gaa aac aat ata aac ttt ttt aat cct gtc 292
Val Val Gly Val Cys Ser Glu Asn Asn Ile Asn Phe Phe Asn Pro Val
75 80 85

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tac aca gat gga gag tta act ggt cat ttg aat ata tca aaa cca act Tyr Thr Asp Gly Glu Leu Thr Gly His Leu Asn Ile Ser Lys Pro Thr 110 115 120	388
atc atg ttt agt tca aag aaa gca ctc ccg ctt att ctg aga gta cag Ile Met Phe Ser Ser Lys Lys Ala Leu Pro Leu Ile Leu Arg Val Gln 125 130 135	436
caa aat cta agt ttc att aaa aaa gtc gta gtt atc gat agc atg tac Gln Asn Leu Ser Phe Ile Lys Lys Val Val Val Ile Asp Ser Met Tyr 140 145 150	484
gac att aat ggc gtt gaa tgc gta tct acc ttt gtt gca cgt tat act Asp Ile Asn Gly Val Glu Cys Val Ser Thr Phe Val Ala Arg Tyr Thr 155 160 165	532
gac cac acc ttt gat cca ttg tca ttt aca cca aaa gat ttt gat ccc Asp His Thr Phe Asp Pro Leu Ser Phe Thr Pro Lys Asp Phe Asp Pro 170 175 180 185	580
ctt gaa aaa atc gca tta att atg tca tca tct gga aca act gga ttg Leu Glu Lys Ile Ala Leu Ile Met Ser Ser Ser Gly Thr Thr Gly Leu 190 195 200	628
cct aag ggt gta gta ctg agc cat aga agt cta act ata aga ttc gtt Pro Lys Gly Val Val Leu Ser His Arg Ser Leu Thr Ile Arg Phe Val 205 210 215	676
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tta cct gga atc ata caa gga tat gga tta act gaa act tgc tgc gct Leu Pro Gly Ile Ile Gln Gly Tyr Gly Leu Thr Glu Thr Cys Cys Ala 330 335 340 345	1060
gta atg att acc cct cat aat gct gtg aaa aca ggt tca act gga aga Val Met Ile Thr Pro His Asn Ala Val Lys Thr Gly Ser Thr Gly Arg 350 355 360	1108
ccc ttg cca tac att aaa gct aaa gtt tta gat aac gct act ggg aag Pro Leu Pro Tyr Ile Lys Ala Lys Val Leu Asp Asn Ala Thr Gly Lys 365 370 375	1156
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att atg aaa gga tat tac aac aat ccg gaa gca act att gat act att Ile Met Lys Gly Tyr Tyr Asn Asn Pro Glu Ala Thr Ile Asp Thr Ile 395 400 405	1252
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gat gga aat ttc ttt ata gtt gat cga ttg aaa gaa ctt att aaa tac Asp Gly Asn Phe Phe Ile Val Asp Arg Leu Lys Glu Leu Ile Lys Tyr 430 435 440	1348
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cat cca agt att gct gat gcg ggt gtt act gga gtt ccg gac gaa ttt His Pro Ser Ile Ala Asp Ala Gly Val Thr Gly Val Pro Asp Glu Phe 460 465 470	1444
ggg gga caa tta cct gct gct tgt gtg tta gaa tct ggc aag acg Gly Gly Gln Leu Pro Ala Ala Cys Val Val Leu Glu Ser Gly Lys Thr 475 480 485	1492
ctg act gaa aag gaa gtt caa gat ttt att gca gca caa gtc act cca Leu Thr Glu Lys Glu Val Gln Asp Phe Ile Ala Ala Gln Val Thr Pro 490 495 500 505	1540
aca aag cat ctt cga ggc ggt gtc gta ttt gta gac agt att ccg aaa Thr Lys His Leu Arg Gly Val Val Phe Val Asp Ser Ile Pro Lys 510 515 520	1588
ggc cct act gga aaa ctc atc aga aag gag ctc cga gaa ata ttt gcc Gly Pro Thr Gly Lys Leu Ile Arg Lys Glu Leu Arg Glu Ile Phe Ala 525 530 535	1636
cag cga gca cca aaa tca aaa tta taagttcaat gtattgcttt agttctaaaa Gln Arg Ala Pro Lys Ser Lys Leu 540 545	1690
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35 40 45
Ser Tyr Ala Gln Ile Phe Glu Thr Ser Cys Arg Leu Ala Val Ser Ile
50 55 60
Glu Gln Tyr Gly Leu Asn Glu Asn Asn Val Val Gly Val Cys Ser Glu
65 70 75 80
Asn Asn Ile Asn Phe Asn Pro Val Leu Ala Ala Leu Tyr Leu Gly
85 90 95
Ile Pro Val Ala Thr Ser Asn Asp Met Tyr Thr Asp Gly Glu Leu Thr
100 105 110
Gly His Leu Asn Ile Ser Lys Pro Thr Ile Met Phe Ser Ser Lys Lys
115 120 125
Ala Leu Pro Leu Ile Leu Arg Val Gln Gln Asn Leu Ser Phe Ile Lys
130 135 140
Lys Val Val Val Ile Asp Ser Met Tyr Asp Ile Asn Gly Val Glu Cys
145 150 155 160
Val Ser Thr Phe Val Ala Arg Tyr Thr Asp His Thr Phe Asp Pro Leu
165 170 175
Ser Phe Thr Pro Lys Asp Phe Asp Pro Leu Glu Lys Ile Ala Leu Ile
180 185 190
Met Ser Ser Ser Gly Thr Thr Gly Leu Pro Lys Gly Val Val Leu Ser
195 200 205
His Arg Ser Leu Thr Ile Arg Phe Val His Ser Arg Asp Pro Ile Tyr
210 215 220
Gly Thr Arg Thr Val Pro Gln Thr Ser Ile Leu Ser Leu Val Pro Phe
225 230 235 240
His His Ala Phe Gly Met Phe Thr Thr Leu Ser Tyr Phe Val Val Gly
245 250 255
Leu Lys Val Val Met Leu Lys Lys Phe Glu Gly Ala Leu Phe Leu Lys
260 265 270
Thr Ile Gln Asn Tyr Lys Ile Pro Thr Ile Val Val Ala Pro Pro Val
275 280 285
Met Val Phe Leu Ala Lys Ser Pro Leu Val Asp Gln Tyr Asp Leu Ser
290 295 300
Ser Leu Thr Glu Val Ala Thr Gly Gly Ala Pro Leu Gly Lys Asp Val
305 310 315 320
Ala Glu Ala Val Ala Lys Arg Leu Lys Leu Pro Gly Ile Ile Gln Gly
325 330 335
Tyr Gly Leu Thr Glu Thr Cys Cys Ala Val Met Ile Thr Pro His Asn
340 345 350
Ala Val Lys Thr Gly Ser Thr Gly Arg Pro Leu Pro Tyr Ile Lys Ala
355 360 365
Lys Val Leu Asp Asn Ala Thr Gly Lys Ala Leu Gly Pro Gly Glu Arg
370 375 380
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 Val Val Asn Gly Asp Arg Pro Arg Asp Leu Val Phe Pro Gly Thr Ala
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gga cta caa tta tat caa tca tta tat aaa tat tca tat att act gac 151
 Gly Leu Gln Leu Tyr Gln Ser Leu Tyr Lys Tyr Ser Tyr Ile Thr Asp
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gga ata atc gat gcc cat acc aat gaa gta ata tca tat gct caa ata 199
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ttt gaa acc agc tgc cgc ttg gca gtt agt cta gaa aaa tat ggc ttg 247
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gat cat aac aat gtt gtg gca ata tgc agt gaa aac aac ata cac ttt 295
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Ser Asn Asp Met Tyr Thr Glu Arg Glu Met Ile Gly His Leu Asn Ile			
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tcg aaa cca tgc ctt atg ttt tgt tca aag aaa tca ctc cca ttt att		439	
Ser Lys Pro Cys Leu Met Phe Cys Ser Lys Lys Ser Leu Pro Phe Ile			
120	125	130	
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gat agt atg tac gat atc aat ggc gtt gaa tgc gta ttt agc ttt gat		535	
Asp Ser Met Tyr Asp Ile Asn Gly Val Glu Cys Val Phe Ser Phe Asp			
150	155	160	165
tca cgt aat act gat cac gcc ttt gat cca gtg aaa ttt aac cca aaa		583	
Ser Arg Asn Thr Asp His Ala Phe Asp Pro Val Lys Phe Asn Pro Lys			
170	175	180	
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Thr Thr Gly Leu Pro Lys Gly Val Val Ile Ser His Arg Ser Ile Thr			
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Pro Asp Thr Ser Ile Leu Ala Ile Ala Pro Phe His His Ala Phe Gly			
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Leu Phe Thr Ala Leu Ala Tyr Phe Pro Val Gly Leu Lys Ile Val Met			
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gtg aag aaa ttt gag ggc gaa ttc ttc tta aaa acc ata caa aat tac		871	
Val Lys Lys Phe Glu Gly Glu Phe Leu Lys Thr Ile Gln Asn Tyr			
265	270	275	
aaa atc gct tct att gta gtt cct cct cca att atg gta tat ttg gct		919	
Lys Ile Ala Ser Ile Val Val Pro Pro Pro Ile Met Val Tyr Leu Ala			
280	285	290	
aaa agt cca tta gtc gat gaa tac aat tgc tcg agc tta acg gaa att		967	
Lys Ser Pro Leu Val Asp Glu Tyr Asn Cys Ser Ser Leu Thr Glu Ile			
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gct agt gga ggc tct cct tta gga aga gat atc gca gat aa a gta gca		1015	
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aag aga ttg aaa gta cat gga atc cta caa gga tat gga tta acc gaa		1063	
Lys Arg Leu Lys Val His Gly Ile Leu Gln Gly Tyr Gly Leu Thr Glu			
330	335	340	

acc tgc agc gct cta ata ctt agc ccc aat gat cga gaa ctt aaa aaa		1111	
Thr Cys Ser Ala Leu Ile Leu Ser Pro Asn Asp Arg Glu Leu Lys Lys			
345	350	355	
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390	395	400	405
act cgt gat gct ctt gac aaa gat ggt tgg ctt cat act ggg gat ctt		1303	
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Gly Tyr Tyr Asp Glu Asp Arg Phe Ile Tyr Val Val Asp Arg Leu Lys			
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gaa ctt att aaa tat aaa gga tat cag gtt gcg cct gct gaa ctg gaa		1399	
Glu Leu Ile Lys Tyr Lys Gly Tyr Gln Val Ala Pro Ala Glu Leu Glu			
440	445	450	
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Glu Pro Gly Lys Thr Met Thr Glu Lys Glu Val Gln Asp Tyr Ile Ala			
490	495	500	
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Glu Leu Val Thr Thr Lys His Leu Arg Gly Gly Val Val Phe Ile			
505	510	515	
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Asp Ser Ile Pro Lys Gly Pro Thr Gly Lys Leu Met Arg Asn Glu Leu			
520	525	530	
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Arg Ala Ile Phe Ala Arg Glu Gln Ala Lys Ser Lys Leu			
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35 40 45
Ser Tyr Ala Gln Ile Phe Glu Thr Ser Cys Arg Leu Ala Val Ser Leu
50 55 60
Glu Lys Tyr Gly Leu Asp His Asn Asn Val Val Ala Ile Cys Ser Glu
65 70 75 80
Asn Asn Ile His Phe Phe Gly Pro Leu Ile Ala Ala Leu Tyr Gln Gly
85 90 95
Ile Pro Met Ala Thr Ser Asn Asp Met Tyr Thr Glu Arg Glu Met Ile
100 105 110
Gly His Leu Asn Ile Ser Lys Pro Cys Leu Met Phe Cys Ser Lys Lys
115 120 125
Ser Leu Pro Phe Ile Leu Lys Val Gln Lys His Leu Asp Phe Leu Lys
130 135 140
Arg Val Ile Val Ile Asp Ser Met Tyr Asp Ile Asn Gly Val Glu Cys
145 150 155 160
Val Phe Ser Phe Asp Ser Arg Asn Thr Asp His Ala Phe Asp Pro Val
165 170 175
Lys Phe Asn Pro Lys Glu Phe Asp Pro Leu Glu Arg Thr Ala Leu Ile
180 185 190
Met Thr Ser Ser Gly Thr Thr Gly Leu Pro Lys Gly Val Val Ile Ser
195 200 205
His Arg Ser Ile Thr Ile Arg Phe Val His Ser Ser Asp Pro Ile Tyr
210 215 220
Gly Thr Arg Ile Ala Pro Asp Thr Ser Ile Leu Ala Ile Ala Pro Phe
225 230 235 240
His His Ala Phe Gly Leu Phe Thr Ala Leu Ala Tyr Phe Pro Val Gly
245 250 255
Leu Lys Ile Val Met Val Lys Lys Phe Glu Gly Glu Phe Phe Leu Lys
260 265 270
Thr Ile Gln Asn Tyr Lys Ile Ala Ser Ile Val Val Pro Pro Pro Ile
275 280 285
Met Val Tyr Leu Ala Lys Ser Pro Leu Val Asp Glu Tyr Asn Cys Ser
290 295 300
Ser Leu Thr Glu Ile Ala Ser Gly Gly Ser Pro Leu Gly Arg Asp Ile
305 310 315 320
Ala Asp Lys Val Ala Lys Arg Leu Lys Val His Gly Ile Leu Gln Gly
325 330 335
Tyr Gly Leu Thr Glu Thr Cys Ser Ala Leu Ile Leu Ser Pro Asn Asp
340 345 350
Arg Glu Leu Lys Lys Gly Ala Ile Gly Thr Pro Met Pro Tyr Val Gln
355 360 365
Val Lys Val Ile Asp Ile Asn Thr Gly Lys Ala Leu Gly Pro Arg Glu
370 375 380
Lys Gly Glu Ile Cys Phe Lys Ser Gln Met Leu Met Lys Gly Tyr His
385 390 395 400
Asn Asn Pro Gln Ala Thr Arg Asp Ala Leu Asp Lys Asp Gly Trp Leu
405 410 415

His Thr Gly Asp Leu Gly Tyr Tyr Asp Glu Asp Arg Phe Ile Tyr Val
420 425 430
Val Asp Arg Leu Lys Glu Leu Ile Lys Tyr Lys Gly Tyr Gln Val Ala
435 440 445
Pro Ala Glu Leu Glu Asn Leu Leu Leu Gln His Pro Asn Ile Ser Asp
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Ala Cys Val Val Leu Glu Pro Gly Lys Thr Met Thr Glu Lys Glu Val
485 490 495
Gln Asp Tyr Ile Ala Glu Leu Val Thr Thr Thr Lys His Leu Arg Gly
500 505 510
Gly Val Val Phe Ile Asp Ser Ile Pro Lys Gly Pro Thr Gly Lys Leu
515 520 525
Met Arg Asn Glu Leu Arg Ala Ile Phe Ala Arg Glu Gln Ala Lys Ser
530 535 540
Lys Leu
545